COTTAGE POLLUTION CONTROL PROGRAM

CRYSTAL LAKE
PENCIL LAKE
CONNOLLY LAKE

COUNTY OF PETERBOROUGH

FOURMILE LAKE

COUNTY OF VICTORIA

1978

Ontario

Ministry of the Environment

The Honourable
Harry C. Parrott, D.D.S.,
Minister

Graham W. S. Scott,
Deputy Minister

COTTAGE POLLUTION CONTROL PROGRAM

1978

COUNTY OF PETERBOROUGH

CRYSTAL LAKE	-	GALWAY TOWNSHIP
CONNOLLY LAKE	-	GALWAY TOWNSHIP
PENCIL LAKE	-	CAVENDISH TOWNSHIP

COUNTY OF VICTORIA

FOURMILE LAKE	-	SOMMERVILLE TOWNSHIP

The field work outlined in this report was carried out by the Cottage Program staff of the Peterborough District Office, Municipal and Private Abatement Section.

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PREFACE

Ontario's thousands of beautiful inland lakes provide an abundant resource for recreational enjoyment. To protect the quality of these waters, a delicate environmental balance must be obtained.

A heavy influx of people may subject a lake and its surrounding environment to great stress. Uncontrolled development and imprudent use of our recreational lakes may cause their deterioration and destroy their natural qualities.

The Ontario Ministry of the Environment is attempting to bring some of these stress factors under control by a variety of programs: one of these, the Cottage Pollution Control Program was initiated in 1970 to study the cottage waste disposal problem, to evaluate existing waste disposal systems and to enforce repairs to those found to be unsatisfactory, and to educate the general public in matters pertaining to private sewage disposal.

The Ministry is also carrying on research to improve the knowledge of septic tank operation and the movement of sewage effluent in shallow soils. Alternative methods of private waste disposal are also being evaluated, and every year new toilet systems are brought into the consumer market after testing by research staff to determine compliance with Ministry requirements.

SUMMARY

The Cottage Pollution Control Program was established to detect and correct faulty private sewage disposal systems of cottages on recreational lakes. The objective of the program is to locate faulty systems, and through cooperation with the owner undertake the required corrective measures.

During the summer of 1978 a total of 928 disposal systems serving cottages in recreation areas were inspected. They were located in Peterborough County on Crystal and Connolly Lakes, in Galway Township; Pencil Lake in Cavendish Township; and Four Mile Lake, in Sommerville Township, in Victoria County.

Of all these systems, 19.5% were found to be satisfactory; 50.6% were seriously substandard; 25.8% were nuisances (wash water or toilet wastes); 1.4% were polluting the lake or ground water, and 2.7% were unclassified at the time of inspection. (See Table I)

The various sewage-system types inspected were summarized. Out of a total of 928 disposal systems checked, 766 (83%)premises had piped water installed, and yet there were only 677 (73%) septic systems. Of the latter, 227 (33%) have been installed since 1970; 224 (33%) were installed during the 1960's and 38 (6%) were installed prior to 1960. There were an additional 188 (28%) systems installed for which the present owners could not give a date of installation. It should be noted that the Health

TABLE 1

PRELIMINARY CLASSIFICATION OF SYSTEMS INSPECTED

PETERBOROUGH DISTRICT - 1978

BODY OF WATER	NUMBER OF SYSTEMS INSPECTED	CLASSIFICATION OF SYSTEMS*															
		SATISFACTORY		SATISFACTORY PERFORMANCE		SERIOUSLY SUBSTANDARD		NUISANCE WASH WASTE		NUISANCE SOLID WASTE		DIRECT POLLUTER		UNCLASSIFIED (TEMP)		UNCLASSIFIED	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
CRYSTAL LK.	480	46	9.6	40	8.3	244	50.8	116	24.2	16	3.3	6	1.3	12	2.5	-	-
PENCIL LK.	41	2	4.8	5	12.2	16	39.0	11	26.8	3	7.4	3	7.4	1	2.4	-	-
FOURMILE LK.	394	35	8.9	53	13.5	198	50.3	86	21.8	6	1.5	4	1.0	12	3.0	-	-
CONNOLLY LK.	13	-	-	-	-	12	92.3	1	7.7	-	-	-	-	-		-	-
TOTAL SURVEY	928	83	8.9	98	10.6	470	50.6	214	23.1	25	2.7	13	1.4	25	2.7	-	-

*SEE PAGE 7 FOR DEFINITION OF CLASSIFICATIONS

Units in Peterborough and Victoria Counties did not come into existance until the mid-1960's and, therefore, any septic tank systems installed prior to then, were not approved by Health Inspectors.

279 outdoor privies were found to be still in active service. Some of these were the primary system for human waste disposal at a cottage, while others were "back-up" systems used in conjunction with existing septic systems, i.e. in winter.

There were other types of toilet systems found as well; 40 holding tanks; 1 aerobic system; 12 cesspools; 2 incinerating toilets (gas or electric); 12 chemical toilets (pail-a-day, or pot pourri, etc.); and 9 composting toilets (humus-type).

A total of 187 cottage drinking water samples were collected. Of these, 18% showed presence of coliform bacteria, which are pollution indicators. A further 929 lake water samples were analyzed: only 0.8% of these samples contained sufficient coliform bacteria to render the water unsafe for swimming.

Abatement work was carried out during and after the summer surveys. Out of 252 problem systems, (nuisance - wash waste 214; nuisance - solid waste 25; polluters - 13) 162 were corrected by fall. Letters were sent out to 470 additional

cottagers whose systems were classified substandard and required upgrading in the future.

Abatement contacts by letter during the fall and winter resulted in 40 more agreements for corrections to be carried out the following spring. Reinspections continued at those premises where corrections were due, and required approval.

Abatement work also continued on lakes inspected in 1977, (Belmont, Round, Cordova, Twin lakes and Crowe River); Out of an original total of 592 problem systems requiring correction, all but 37 have been reclassified; as of October, 1978 agreements were in effect at 34 of these premises, and efforts were being made to contact the other 3.

All abatement work has been completed on lakes inspected in 1976. (Kasshabog, Oak, Methuen).

DESIGN OF THE SURVEY

Preparation

During the winter of 1977, Crystal, Fourmile and Pencil Lakes were mapped during a snowmobile reconaissance program carried out by staff from the Peterborough office.

The snowmobile crews counted the total number of establishments on each lake, and described every one hundredth "control" establishment on the shoreline, plotted these cottages on maps and located non-cottage properties such as marinas, campgrounds and lodges.

Data obtained from the snowmobile work, as well as that from Cottage Owner's Associations and other agencies, was used to prepare a work schedule for the student crews.

Prior to the commencement of the summer surveys, representatives from each of the lakes' Cottage Associations met with Ministry staff at a meeting in Peterborough. Members were given details of the pending survey, its procedure and format. An explanatory newsletter, prepared by the Ministry was distributed to the executive of each association for mailing to all cottagers with their spring bulletin. In this way, the greatest possible cross-section of cottagers was notified of the survey to follow, whether they were Association members or non-members, whether attending the meetings or not.

Mid-season meetings, in some cases, are also held with cottagers to explain corrective procedures and progress of the survey.

Detection Survey

Two crews, composed of two students each, began the survey of each lake by preparing the "description log" of cottages, in which each establishment was systemically numbered and accurately described.

Each establishment on consecutive lakes was then inspected with regard to: type of disposal system, location and design, soil type in area of all tile beds, presence of leaching pits or privies; to provide data on nature and depth of soil, source of drinking water and other related factors. Initially only those cottages were inspected where the owner was home, but by the end of August, inspections were done without the owner present, if he had not been found at his cottage all summer.

A preliminary classification of all waste disposal systems was made by the students prior to turning over the file to their supervisor for final classification.

One student was assigned to the field office trailer located at Crystal Pier Marina on Crystal Lake, where she undertook typing and filing duties, along with answering enquiries from the general public either over the phone or directly. An additional student was designated an Assistant to the Abatement Officer, conducting re-inspections and dealing with cottagers who required minor corrections to their systems.

Classification of Sewage Disposal Systems

All premises surveyed were classified into one of the following groups:

1. SATISFACTORY - A system which meets all current standards of good design, construction and location, and is properly maintained.

2. SATISFACTORY (ACCEPTABLE) PERFORMANCE - A system which may not quite meet current standards of design and construction but is properly located with respect to lake, well, etc., and maintained in good condition.

3. SERIOUSLY SUBSTANDARD - A system which does not meet current standards of design, construction, and location and/or is in a state of neglect. The owner is notified of the deficiency and he is advised that consideration should be given to up-dating the system in the near future. Although this system is not deemed to be causing pollution at the time of inspection, a potential hazard exists.

4. NUISANCE (WASH WATER) - A system causing wash water to be exposed on the surface of the ground either directly through a waste pipe or escaping from a seepage pit or just thrown on ground surface. Wash water discharged from any sanitary fixture is contaminated and creates an unhealthy environment. Phosphates and other nutrients

from waste discharges encourage weed growth and affect the aesthetic quality of the lake.

5. NUISANCE (TOILET AND SOLID WASTE) - A system causing a waste containing faecal or urinary discharges to be exposed on the surface of the ground, either directly through a pipe or escaping from some part of a sewage disposal system including a privy. Also, included in this classification, is "solid waste" or garbage of a kind which can cause a "nuisance", e.g. domestic garbage containing foodstuff.

6. DIRECT POLLUTER - A system which is permitting sewage to contaminate the ground water, or to reach the lake either by direct discharge through a pipe or ditch or over the ground surface.

7. UNCLASSIFIED (TEMPORARILY) - A system which has been given a preliminary classification by the student inspector, but he cannot assign any of the proceding classifications and has doubts about the system or part of it. These systems require further inspections by the supervisor who will attempt to make a final classification after a thorough investigation.

8. UNCLASSIFIED - A system which still cannot be classified at the end of the survey. Usually these amount to only a few and include abandoned or ruinous premises.

WATER SAMPLING

The Public Health Laboratories in Peterborough provided the necessary water sample analyses to detect Total and Faecal coliforms in the lake water samples. These samples were important for the tracing of sources of pollution entering the lake. They were not taken in sufficient number or frequency to investigate the over-all water quality of the lake surveyed.

During the cottage survey, drinking water samples were also analysed when the owner was using untreated lake water or a private well supply. These samples were analysed at the Public Health Laboratory and all owners having drinking water samples taken, were immediately informed by mail of the results and instructions were also sent regarding procedures for disinfecting the drinking water supply, if found unsatisfactory. Of 187 drinking water samples taken, 34 or 18% were found unsatisfactory, that is, containing total or faecal coliforms. (Table II)

Lake water samples were taken in front of each cottage at the dock or swimming area. The Ministry's booklet "Guidelines and Criteria for Water Quality Management, July,1974", states that where ingestion is probable, recreational waters can be considered impaired when the coliform, faecal coliform and/or enterococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml. respectively, in a series of at least 10 samples per month, including samples collected during weekend periods.

TABLE II

WATER SAMPLE RESULTS

1978

LAKE	LAKE WATER SAMPLES			DRINKING WATER SAMPLES		
	TOTAL	MET CRITERIA*	EXCEEDED CRITERIA*	TOTAL	SAFE	UNSAFE
CRYSTAL LAKE	478	475	3	120	97	23
FOURMILE LAKE	400	398	2	64	55	9
PENCIL LAKE	39	38	1	-	-	-
CONNOLLY LAKE	12	11	1	3	1	2
TOTALS	929	99.2%	0.8%	187	182%	18%

Note: 1. The designations "Safe" and "Unsafe" are in accordance with the drinking water sample interpretation chart pamplet "Understanding the Bacteriological Report on your Drinking Water", produced by the Ontario Ministry of Health.

2. No drinking water sample was taken if drinking water was being treated or brought from a municipal supply.

3. It should be noted that above Lake Water results were obtained from a single sample only, at each location.

*4. "Criteria for Water Quality Management, July 1974"

Of 929 lake water samples taken, only 7 or 0.8% did not meet these criteria; these results should not be interpreted to indicate overall lake water quality, as only a single sample was obtained in front of each cottage over the entire summer season.

ABATEMENT & CORRECTION PROCEDURE

Once the inspection crew completes the data form and sketch for a cottage premises, assigning a classification, the file is examined by the supervisor, and the original classification confirmed. The abatement officer then interviews the establishement owner where a problem has been found to advise him of the findings and discuss corrective action. An abatement program is initiated and the owner signs a Pollution Abatement Report, which outlines the corrections and date of completion. A final inspection is carried out upon completion of the corrective work, and the sewage disposal system is re-classified.

Contacts by mail or telephone continue through the fall and winter, to obtain corrective agreements. In some instances, cottagers are asked to attend a personal interview with the Abatement Officer.

In the case of commercial establishments, this procedure is often more complicated requiring an engineering study and the submission of plans for approval with soils analysis report. In these instances, unless he is a direct polluter, the owner is contacted and is instructed to submit plans for the corrective measures to be completed prior to the opening of the next commercial season. A direct polluter must take corrective action immediately to prevent pollution of the lake.

METHODS OF SEWAGE DISPOSAL

Much of the shoreline property in the Kawarthas has minimal soil cover over bedrock and thus is unsuitable, in its natural state, for sub-surface sewage disposal. This can be remedied in some areas by importing granular material over an area capable of supporting a sub-surface sewage disposal system. The use of a holding tank may provide a more economical solution for the disposal of sewage and may be recommended if a contract for the pump-out of the tank can be secured. On some lots where there is restricted space for a sewage disposal system, the installation of a proprietary aerobic sewage treatment system may provide a viable alternative.

Recently, there have been many developments in sewage disposal systems and the Ministry of the Environment is continually monitoring new systems being marketed in Ontario.

The Health Unit administering the septic tank program for the Ministry in the area must be consulted and approval obtained before any sewage disposal system is installed, altered, repaired or enlarged.

1978 COTTAGE POLLUTION CONTROL PROGRAM

CRYSTAL LAKE

Crystal Lake is situated in Galway Township, approximately 31 miles (50 km) north of the City of Peterborough.

The surrounding area is heavily wooded and very hilly, broken only occasionally by a few open abandoned fields or marshes. The shoreline of the lake is generally quite steep and rocky. The west end, which is made up of long narrow bays divided by equally narrow peninsulas, has very steep slopes. Soil depth varies between 2 to 5 feet or more in pockets between rock outcrops and consists of a coarse sandy till. The rock is comprised mainly of granite, with localized limestone outcrops.

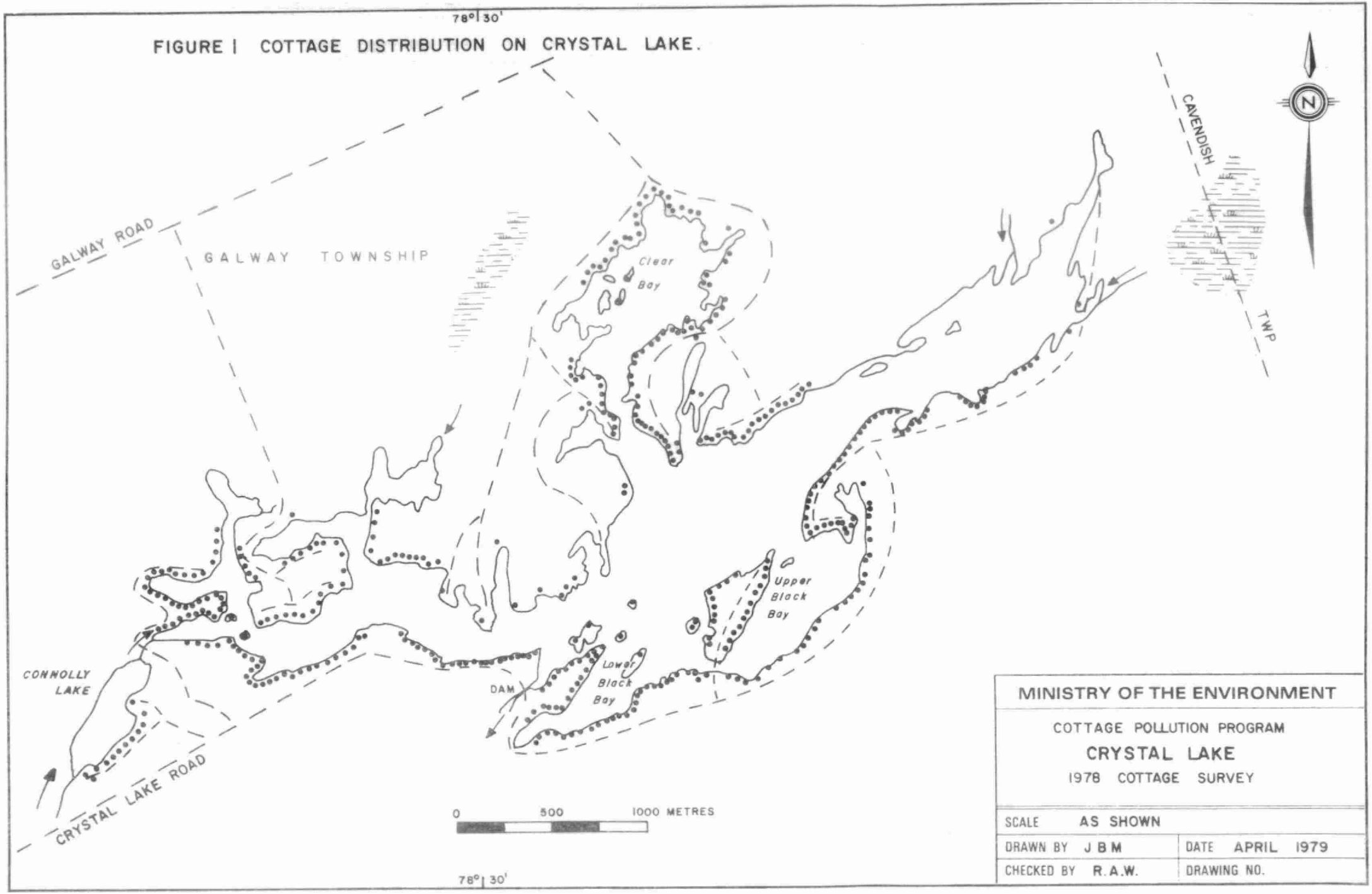
There are 10 small islands in the lake, each with 1 or 2 cottages. A large former island, now connected to the mainland with a small causeway and bridge, and having 24 cottages, is still known by the name of "Peters Island", to cottagers.

Surface area of Crystal Lake is approximately 1100 acres, with a total shoreline length of 26 miles (42km). The maximum water depth is 118 feet (35m) with a mean depth of 39 feet (12m).

There are four inflows to Crystal Lake, and one major outflow, at the dam to Nogies Creek, this dam, operated by the Trent Severn Waterways Office of Parks Canada, creates a fluctuation of as much as 7 feet between spring and late fall.

78° 30'

FIGURE I COTTAGE DISTRIBUTION ON CRYSTAL LAKE.



MINISTRY OF THE ENVIRONMENT	
COTTAGE POLLUTION PROGRAM CRYSTAL LAKE 1978 COTTAGE SURVEY	
SCALE AS SHOWN	
DRAWN BY J B M	DATE APRIL 1979
CHECKED BY R.A.W.	DRAWING NO.

For the most part, Crystal Lake is free of nuisance weeds. Pondweed, tapegrass and coontail are found along most of the shoreline, but in some of the bays, particularly at the west end, i.e. Mill Bay and Collins Bay, the Eurasian Milfoil weed has made its appearance and created nuisance conditions in front of some cottages, necessitating localized chemical treatment.

There were 460 establishments which had their sewage systems inspected, 13 of these being on islands. Guest cabins, rental cottages, etc., brought the actual number of sewage systems checked to 480. Included in these figures are 3 marinas, and 2 cottage-rental establishments.

Out of the 480 systems inspected, only 46 (9.6%) were classified Satisfactory; 40 (8.3%) were Satisfactory Performance; 244 (50.8%) were Seriously Substandard; 116 (24.2%) were wash water Nuisances; 16 (3.3%) were solid waste Nuisances; 6 (1.3%) were Polluters and 12 (2.5%) were temporarily Unclassified at the time of inspection.

478 lake water samples were taken; of these, only 3 samples analysed showed more than 1000 total coliforms per 100 ml. or more than 100 faecal coliforms per 100 ml. As well, 120 drinking water samples were analysed, 23 of these showed a presence of coliform bacteria, indicating that the water was not safe to drink. All those who had drinking water samples taken at their premises, were notified by mail of the results.

Water Quality - Crystal Lake

In 1977, a comprehensive study was undertaken on Crystal Lake, not only to determine water quality, but to assess the possible effects of additional developement on the lake. A report was prepared and copies are available from the Ministry's Regional Office, at 150 Ferrand Drive, Don Mills. The report is entitled "Water Quality of Crystal Lake in Relation to Shoreline Development".

Sewage Systems In Use: Type, Age, Etc.

On Crystal Lake, there were 412 establishments which had piped water systems, but only 347, which had septic systems. Of these septic systems, 13 were installed before 1960; 122 were installed in the 1960's and 124 have been installed in the 1970's to present day; the installation date of 88 others was not known by the present cottage owners.

Prior to the mid 1960's there was no Health Unit existing, and therefore any sewage system installed before then did not receive an inspection by a Health Inspector.

161 privies were found to be in serviceable condition, and still being used either as the main sanitation facility or as a second or "emergency" system such as for winter use, when water systems are inoperable. As well, other types of sewage systems were found also: chemical toilets (pail-a-day, portables, etc.,) - 5 ; incinerating toilets (electric) - 1; cesspools - 8; aerobic system - 1; holding tank systems - 17; composting toilets i.e. "Humus" - 8.

FOURMILE LAKE

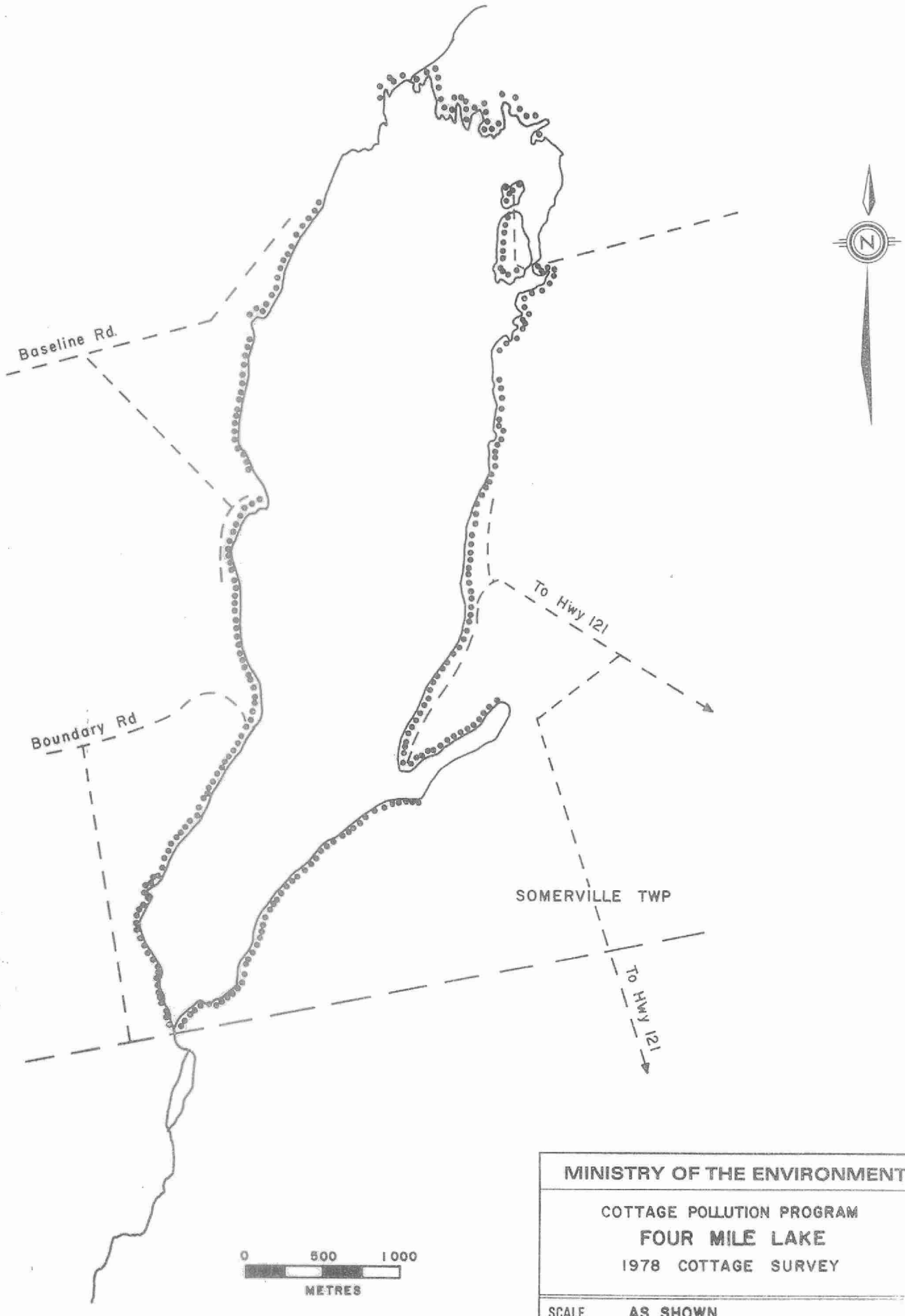
Fourmile Lake is situated in Sommerville Township in Victoria County, approximately 10 miles (16km) northeast of Fenelon Falls.

The terrain locally is rolling with some flat areas; shorelines are very steep along the west shore, and moderately steep along the east side with some limestone cliff-like formations at the shore in the south east portion. Bedrock is mainly limestone with occurrances of granite only in the northern-most regions of the lake. Soil cover is shallow in most areas, consisting of coarse sandy till. A few scattered small islands are located in the north end of the lake, however, none are large enough to hold cottages. Two large former islands at the north east corner of the lake are now linked to the mainland and to each other by man-made causeways; 21 establishments are located on these two former islands.

Fourmile Lake has about 12 miles (19km) of shoreline, with a surface area of 1943 acres, or about 3 square miles. Maximum water depth is 63 feet (21m) mean depth is 28 feet (9m)

The only outflow from Fourmile is at the south end, where Corben Creek flows under the bridge; there is no dam, a natural rock shelf forms a spillway. Three inflows, one of which is Corben Creek have very little measurable in-

FIGURE 2 COTTAGE DISTRIBUTION ON FOUR MILE LAKE.



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FOUR MILE LAKE

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flow, indicating that perhaps Fourmile Lake must have some inflow from springs, to provide the volume of outflow at Corben Creek.

Although some shallow bays in the Lake were abundant with common aquatic weeds, such as soft stem bullrush and white and yellow water lily, there were no sightings reported of nuisance weeds such as milfoil.

There were 358 establishments inspected on Fourmile Lake , and 394 sewage systems found. There were no commercial establishments on Fourmile Lake, nor were there any island cottages.

Out of 394 sewage systems inspected, only 35 (8.9%) were classified Satisfactory; 53 (13.5%) were classified Satisfactory Performance; 198 (50.3%) were classified as Seriously Substandard; 86 (21.8%) were classified Nuisances (wash waste), while 6 (1.5%) were classified Nuisances (solid waste). There were only 4 (1.0%) Polluters found; an additional 12 (3.0%) were temporarily Unclassified at time of inspection.

400 shoreline water samples were taken for analysis; only 2 of these showed the presence of more than 1000 total coliform per 100 ml or more than 100 faecal coliforms per 100 ml. There were also 64 drinking water samples taken for analysis; of these, 9 showed the presence of total or faecal coliform bacteria, indicating they were unfit to drink. All cottagers who had drinking water samples taken at their premises, were notified by mail of the results.

Water Quality - Fourmile Lake

Four Mile Lake was studied in 1971 and 1972 by Dillon and Rigler*. The lake has moderately hard water. The mean secchi disc depth during 1972 was 5.5 meters indicating good water clarity. Favourably low algae densities were indicated by a mean chlorophyll a concentration of 1.4 ug/l. Based on these two parameters Four Mile Lake was considered unenriched. The 400 samples taken during the cottage survey, comprised only 1 sample from each cottage frontage and were taken only to spot any localized problems.

Sewage Systems In Use: Type, Age, Etc.

Out of 321 establishments which had piped water, 310 (96.6%) had septic systems also. Of these 310 systems, 22 were installed before 1960; 97 were installed from 1960-69, while an additional 97 were installed from 1970 to the present day; 94 additional systems exist for which the present owners were unable to provide the installation date. Since the Health Unit did not come into existence until about the mid-1960's, systems installed prior to that date did not get inspection by a Health Inspector.

The inspection teams found 88 outdoor privies still in service, and used either as the main sanitation facilities for the cottage, or as a second, or "emergency" facility, such as for winter use when water systems are disconnected.

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* Dillon and Rigler 1974. The Phosphorus Chlorophyll relationship in lakes. Limnology and Oceanography 19 (5):767-773. Dillon and Rigler 1974. A Test of a simple nutrient budget model predicting phosphorus concentration in lake water. J. Fish. Res. Board Can. 31:1771-1778.

There were sewage systems other than septics, and these were as follows: chemical toilets/pail-a-day, portables, etc.) (6); incinerating toilets (1); composting toilets i.e. "Humus" (1); Cesspools (3); Holding Tanks (22).

PENCIL LAKE

Pencil Lake is located approximately 40 miles (64km) north of Peterborough, in Cavendish Township, Peterborough County.

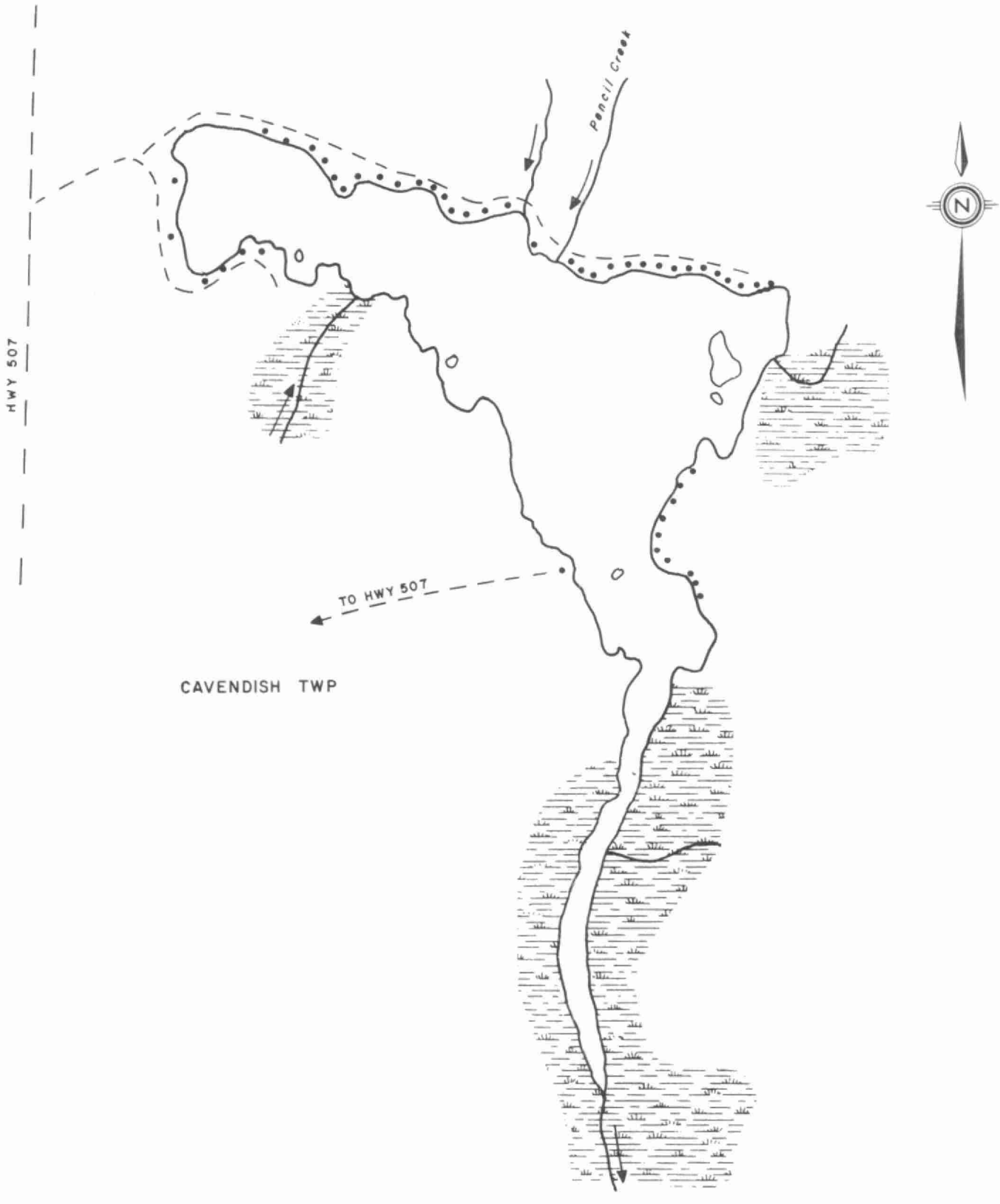
The surrounding area is heavily forested and hilly. Since Pencil Lake is situated in the Precambrian Shield region, granite bedrock outcroppings are frequent, with shallow overburden consisting of coarse sandy till.

Pencil Creek is the main inflow to the lake, at the north east end; there are 4 minor inlets, with minimal flow. Pencil Creek leaves the lake at the south end, eventually flowing into Catchacoma Lake.

Pencil Lake is just over 1 mile in length, and approximately ½ mile at its widest point. Surface area is approximately .3 square miles; maximum depth is 75 feet (23 metres) while mean depth is 28 feet (8.4 metres).

39 establishments were inspected on the lake, and 41 sewage systems were found; of these systems, only 2 (4.9%) were classified Satisfactory; 5 (12.2%) were classified Satisfactory Performance; 16 (39.1%) were classified Seriously Substandard; 11 (26.8%) were classified Nuisances (wash water) and 3 (7.3%) were classified Nuisance (solid waste); 3 (7.3%) were classified Polluters, and 1 (2.4%) was temporarily Unclassified at time of inspection.

FIGURE 3 COTTAGE DISTRIBUTION ON PENCIL LAKE.



MINISTRY OF THE ENVIRONMENT

COTTAGE POLLUTION PROGRAM

PENCIL LAKE

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39 shoreline water samples were taken and analysed; only 1 showed the presence of coliform or faecal bacteria to exceed 1000 per 100 ml or 100 per 100ml respectively. No persons contacted used the lake or wells for drinking purposes, and therefore no samples were collected for analysis.

Water Quality - Pencil Lake

In 1976, an extensive water sampling program was undertaken, to determine water quality in Pencil Lake. The results and interpretation were published in a report, in 1978, entitled "Water Quality of Pencil Lake in Relation to Shoreline Development".

Copies of this report are available upon request, at no charge, from the Ministry's Regional offices at 150 Ferrand Drive, Don Mills.

Sewage Systems in Use: Age, Type, etc.

39 cottages were inspected on Pencil Lake; of these, 24 had piped water installed, but only 11 of thse had septic systems as well. 27 outdoor pit privies were noted, either as the main sanitation facility or as a secondary system. Of the 11 septic systems, apparently none were installed prior to 1960; 3 were installed between 1960 and 1969, and 6 installed between 1970 and the present day. Cottagers contacted could not give installation dates for the remaining 2. The only other type of waste disposal systems found were: 1 holding tank, and 1 chemical toilet.

CONNOLLY LAKE

Connolly Lake is situated just a few hundred yards west of Mill Bay of Crystal Lake, sharing the same soil type and topographic features. It is a small lake, approximately ½ mile long, by ¼ mile wide. A stream of mimimal flow enters Crystal Lake from Connolly Lake.

12 cottages were inspected on Connolly Lake; 13 sewage systems were found. All but one cottage had water frontage, the exception appearing to be a back lot with access. 12 systems were found to be Seriously Substandard, the remaining system was classified as Nuisance (wash water).

Of 12 shoreline water samples collected, 1 showed coliform and faecal bacteria to exceed 1000 or 100 per 100 ml respectively. Of 3 drinking water samples analysed from cottager's taps, 2 were found to contain total and faecal coliform bacteria, rendering them unsafe to drink. Both cottagers were notified accordingly, by mail.

9 cottages had piped water installed; all 9 also had septic systems. 3 were installed prior to 1960; 2 were installed between 1960 and 1969; none were apparently installed in the years from 1970 to present, while installation dates for the remaining 4 could not be given by the present cottage owners. 3 outdoor privies were found functioning either as a primary system, or as a backup sanitational system. 1 cesspool was also found to be still in operation.

FOLLOW-UP ABATEMENT

On the lakes and rivers surveyed, 27% of all systems checked required corrections, whether minor like a leaching pit installation or privy relocation to major undertaking such as complete septic system installations. 252 systems in all, required correction; by the end of the summer, 193 signed agreements had been secured from cottagers to do corrections, by one permanent Ministry Abatement Officer and as assistant working under his supervision. From these agreements, 162 systems had been corrected and reclassified by fall; the balance of agreements were to become due in 1979.

During the winter months, Ministry staff continued abatement follow-up by mail; in this way, 40 agreements were secured for corrections falling due in the summer of 1979.

Approximately 19 cottagers remained to be contacted during the summer of 1979 for necessary corrections. Field revisits during that period are expected to reach all those premises where corrections are necessary.

INFORMATION OF GENERAL INTEREST TO COTTAGERS

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups: the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease-causing micro-organisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious waterborn infections such as typhoid fever, polio or hepatitis, but he may catch less serious infections of gastro-enteritis (sometimes called stomach flu), dysentery or diarrhea.

Included in these minor afflictions are eye, ear and throat infections that swimmers encounter every year and the more insidious but seldom diagnosed, subclinical infections usually associated with several waterborn viruses.

These viral infections leave a person not feeling well enough to enjoy holidaying although not bedridden. This

type of microbial pollution can be remedied by preventing wastes from reaching the lake and water quality will return to satisfactory conditions within a relatively short time (approximately 1 year) since disease causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise, in turn to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lake bacteria. Unfortunately, biodegradation of organic wastes by organisms uses correspondingly large amounts of the dissolved oxygen. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxygen supply in the bottom waters and threaten the survival of many deep water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of the recreational lakes. Heavy precipitation has been shown to flush the land area around the lake and the subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, faecal coliforms and faecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Pre-Cambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up within 12 to 43 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals and birds (all of which can be carriers of disease); consequently, NO SURFACE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment, including disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

a) Boiling

Boil the water for a minimum of five minutes to destroy the disease-causing organisms.

b) Chlorination using a household bleach containing 4 to 5.1/4% Available Chlorine

Eight drops of a household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

c) Continuous Chlorination

For continuous water disinfection, a small domestic hypochlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at 5% available chlorine) if the depth of water and diameter of the well are known.

CHLORINE BLEACH

per 10 ft. depth of water

Diameter of Well Casing in Inches	One to Ten Coliforms	More than Ten Coliforms
4	.5 oz.	1 oz.
6	1 oz.	2 oz.
8	2 oz.	4 oz.
12	4 oz.	8 oz.
16	7 oz.	14 oz.
20	11 oz.	22 oz.
24	16 oz.	31 oz.
30	25 oz.	49 oz.
36	35 oz.	70 oz.

Note: Allow about six hours of contact time before using the water.

Another bacteriological sample should be taken after one week of use.

Water sources (spring, lake, well, etc.) should be inspected for possible contamination routes (surface soil, runoff following rain and seepage from domestic waste disposal sites). Attempts at disinfecting the water alone without removing the source of contamination will not supply bacteriologically safe water on a continuing basis.

There are several types of low cost filters (ceramic, paper, carbon, diatomaceous earth sometimes impregnated with silver, etc.) that can be easily installed on taps or in water lines. These may be useful to remove particles if water is periodically turbid and are usually very successful. Filters, however, do not disinfect water but may reduce bacterial numbers. For safety, chlorination of filtered water is recommended.

SEPTIC TANK INSTALLATIONS

In Ontario, provincial law requires under Part 7 of the Environmental Protection Act that before you extend, alter, enlarge or establish any building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to issue the Certificate of Approval. Any other pertinent information such as size, types and location of septic tanks and tile fields can also be obtained from the same authority.

General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake stream, pond, spring, river or reservoir.
- 5 feet to any building.
- 10 feet to any property boundary.

The tile field should not be closer than:

- 100 feet to the nearest dug well.
- 50 feet to a drilled well which has a casing to 25 feet below the ground.
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed.
- 10 feet to any other building.
- 10 feet to a property boundary.
- 50 feet to any lake, stream, pond, spring, river or reservoir.

The ideal location for a tile field is in a well drained, sandy loam soil remote from any wells or other drinking water sources.

For the tile field to work satisfactorily, there should be at least 3 feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

Recognizing that private sewage systems are relatively inefficient where shallow and inappropriate soil conditions are present (e.g. Pre-Cambrian areas), the Ministry of the Environment is conducting research into alternate methods of private sewage disposal in un-sewered areas; into the improvement of existing equipment and methods of design and operation for these systems; and into the development of better surveillance methods such as by the use of chemical, biological and radioactive tracers to detect the movement of pollutants through the soil mantle.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest amongst cottage owners to dye test their sewage systems, however, several problems are associated with dye testing. Dye would not be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his system and no dye was visible in the lake, he would assume that his system is satisfactory, which might not be the case.

A low concentration of dye is not visible and, therefore, expensive equipment such as a fluorometer is required. Only qualified people with adequate equipment are capable

of assessing a sewage system by using dye. In any case, it is likely that some of the water from a septic tank will eventually reach the lake. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region and the shape and flow of the shifting water table are required. Therefore, we recommend that this type of study should be performed only by qualified professionals.

BOATING REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats must be retained in equipment of a type approved by the Ministry of the Environment. Equipment which will be approved by the Ministry of the Environment includes: (1) retention devices with or without circulation which retain all toilet wastes for disposal ashore, and (2) incinerating devices which reduce all sewage to ash.

To be approved, equipment shall:

1. be non-portable
2. be constructed of structurally sound material
3. have adequate capacity for expected use
4. be properly installed
5. in the case of storage devices, be equipped with the

necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with 1½ inch National Pipe Thread is commonly used).

An Ontario regulation requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "tips" may be of assistance to you in regard to boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.
5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent "blow-back".
6. Empty oil cans must be deposited in a leak-proof receptacle, and
7. Slow down and save fuel.

PHOSPHORUS AND DETERGENTS

Scientists have recognized that phosphorus is the key nutrient in stimulating algae and plant growth in lakes and streams.

In the past years, approximately 50% of the phosphorus

contributed by municipal sewage was added by detergents. Federal regulations reduced the phosphate content of P_2O_5 in laundry detergents from approximately 50% to 20% on August 1, 1970, and to 5% on January 1, 1973.

It should be recognized that automatic dishwashing compounds were not subject to the government regulations and that surprisingly high numbers of automatic dishwashers are present in resort areas (a questionnaire indicated that about 30 percent of the cottages in the Muskoka lakes have automatic dishwashers). Cottagers utilizing such conveniences may be contributing significant amounts of phosphorus to recreational lakes because automatic dishwashing compounds are characteristically high in phosphorus. Indeed, in most of Ontario's vacation land, the source of domestic water is soft enough to allow the exclusive use of liquid dishwashing compounds, soap and soap-flakes which are, in general, relatively low in phosphorus.

BLACKFLIES AND MOSQUITOES

These are the most bothersome, biting insects in the cottage country. Mosquitoes breed in any kind of standing water whether a roadside ditch, unemptied pails of rainwater, flat roofs or swampy areas. The simplest method for controlling mosquito larvae is making sure that all standing water in any kind of receptacle around the cottage is kept empty. The property should be laid out so that water standing in ditches is kept running, by careful drainage

planning. Swimming pools should be properly filtered and chlorinated, and eavestroughs should be kept clear of leaves. Low depressed areas that might fill with water should be filled in. In the garden areas and lawns, regular mowing of weeds and grass, trimming hedges and removing unnecessary shrubbery will help remove wind and sun protection from adult mosquitoes. To minimize bites, make sure any holes in screening are repaired, and make sure the screens are tightly sealed. Restrict outdoor activities in the evenings if at all possible, and keep the damper on your fireplace closed.

Lighter coloured clothing is less attractive to a hungry mosquito and if you're working or visiting in areas where the mosquito population is heavy, make sure to wear loose protective clothing such as long sleeved shirt, light jacket, slacks and socks. Mosquitoes are particularly bothersome at night and in dark wooded areas, during the day, so take the proper precautions and you'll suffer less.

Repellents are available in both liquid or stick form. Read the instructions carefully before using and be careful not to get the material in your eyes or mouth. The types that contain a higher concentration (in percentage) of the active ingredient will do a better job.

Blackflies are particularly bothersome in the early weeks of summer. They breed in fast-flowing watercourses so the best method of fighting them is by larviciding over a large

area. This kind of project is best managed by a community or provincial government agency. Fogging or pesticidal spraying over a large area will have temporary benefits but the practice does not justify the hazard of contamination of nearby water bodies. Complete eradication of biting fly populations can never be realized, and real control is not possible because of the limitation of funds and a lack of sufficiently trained personnel. Individual landowners may operate their own larviciding in small areas (swamps, standing water and rain pools adjacent to cottages) but it should be remembered that permits are required where the program might affect adjacent streams or lakes.

The permit must be obtained from the Pesticides Control Section, Ministry of the Environment, 1 St. Clair Ave. West, Toronto, Ontario M4V 1P5.

AQUATIC PLANT CONTROL

Many shallow lakes, such as those in the Kawartha district, provide ideal conditions for aquatic plants. These lakes are warm in summer and the profuse plant life provides an excellent habitat for sport fish species. Unfortunately, the plants pose a problem when man attempts to use the lakes for recreation. These lakes may be quite healthy, but the plants are only a "problem" when man wants to make specific use of the water.

Complete removal of the plant life is not desirable since it is important for good fishing. Some management technique is needed that will satisfy the needs of boaters, fishermen and swimmers, but that also will maintain the lake's healthy state.

PLANT HARVESTING

Mechanical harvesting has shown to be applicable to the Kawartha situation. Ministry of the Environment experiments in Chemong Lake in 1976 covered more than 1,000 acres of the lake. The fish were there, but the fisherman could not get to them because of the heavy plant growth.

Plant harvesting is a good example of a technique which satisfies man's requirements and still protects or even improves the natural lake conditions.

THE A.I.D. METHOD

Many lakes become low in oxygen in bottom waters during the summer. This results in decreased chemical quality and a loss of fish habitats. AID is simply a mechanical means of keeping the waters well mixed, thereby assuring a good distribution of oxygen in all parts of the lake. The method used experimentally by the Ministry of the Environment consisted of a shore-located compressor pumping air through a long perforated tube along the lake bottom. The bubble action caused the waters to "turn over", aerating the water.

The benefits are:

- improved chemical quality
- decrease in algae
- increased water clarity
- improved fish habitat
- reversed eutrophication effects

Trout fisheries have been restored in two experimental lakes and the techniques have been applied in at least three cases to solve particular problems.

- Heart Lake for algae control
- Valens Reservoir for algae control
- Scotch Block Reservoir for chemical water quality control

The AID method is one of the safest, cheapest and most effective lake management techniques available.


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